PB-218 714

EXHAUST EMISSIONS FROM FOUR GENERAL MOTORS LOW EMISSION PROTOTYPE VEHICLES

Henry L. Gompf

Environmental Protection Agency
Ann Arbor, Michigan

April 1972

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

72-23
PB 218 714
APTD-1407

EXHAUST EMISSIONS FROM FOUR GENERAL MOTORS LOW EMISSION PROTOTYPE VEHICLES

April 1972

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

Henry L. Gompf
Test and Evaluation Branch
Environmental Protection Agency

8

BIBLIOGRAPHIC DATA SHEET	1. Report No. APTD-1407	2.	3. Recipient's Accession No. PB-218 714
4. Title and Subtitle Exhaust Emissions from Four General Motors Low Emission Prototype Vehicles			5. Report Date April 1972 6.
7. Author(s) Henry L. Gompf			8. Performing Organization Rept. No.
9. Performing Organization Name and Address ENVIRONMENTAL PROTECTION AGENCY Test and Evaluation Branch Ann Arbor, Michigan			10. Project/Task/Work Unit No. 11. Contract/Grant No.
12. Sponsoring Organization Name and Address Same			13. Type of Report & Period Covered Inhouse 14.

15. Supplementary Notes

16. Abstracts

The General Motors Corporation supplied four low emission prototype vehicles for evaluation. The test vehicles were desired to demonstrate possible 1975-76 emission control systems and to compare emissions measured by the 1972 and 1975 Federal Emission Test Procedures. The four vehicles are described as follows: (1) An Oldsmobile 88 equipped with a 455 CID engine, automatic transmission, exhaust gas recirculation, an oxidizing catalytic reactor and an air pump; (2) An Oldsmobile 88 with a 455 CID engine and automatic transmission equipped with exhaust gas recirculation, dual bed oxidizing-reducing catalytic reactor and an air pump; (3) A 455 CID Oldsmobile 88 equipped with an automatic transmission, exhaust gas recirculation, two oxidizing catalysts, an air valve, and converted to run on LPG fuel; (4) A Buick Gran Sport with 455 CID engine and automatic transmission equipped with a modified intake manifold, exhaust gas recirculation, oxidizing catalyst and air pump systems. All testing was performed in accordance with the July 2, 1971, Federal Register. Tabulated results indicate while three of the vehicles tested demonstrated emission levels approaching those required for 1975 with one of these achieving 1976 levels in one test, these are experimental vehicles with no definitive measure of the durability capabilities of the system.

17. Key Words and Document Analysis. 17a. Descriptors

Air pollution
Exhaust emissions
Prototypes
Evaluation
Tests
Standards
Air pollution control equipment
Vehicles
Catalysts
Carbon monoxide
Carbon dioxide
Nitrogen oxides

17b. Identifiers/Open-Ended Terms

Federal Test Procedure (1972)
Federal Test Procedure (1975)
Low emission vehicles

17c. COSATI Field/Group 13B

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited /	UNCLASSIFIED	58
	20. Security Class (This Page) UNCLASSIFIED	22. Price 3.00

FORM NTIS-35 (REV. 3-72)

USCOMM-DC 14952-P72

Background

The General Motors Corporation supplied four low emission prototype vehicles to the Office of Air Programs for evaluation. The test vehicles were desired to demonstrate possible 1975-76 emission control systems and to compare emissions measured by the 1972 and 1975 Federal Emission Test Procedures. Testing of each vehicle at both the GM and EPA laboratories enabled comparison of low emission test capabilities.

Vehicles Tested

The following is a brief description of each of the vehicles tested:

Vehicle #61420

The test vehicle was an Oldsmobile 88 equipped with a 455 CID engine and automatic transmission, The vehicle was equipped with exhaust gas recirculation, an oxidizing catalytic reactor and air pump. The fuel specified was Indolene Clear (lead free).

Vehicle #61421

An Oldsmobile 88 with a 455 CID engine and automatic transmission was equipped with exhaust gas recirculation, dual bed oxidizing-reducing catalytic reactor and an air pump. Test fuel was Indolene Clear (lead free).

Vehicle #60418

A 455 CID Oldsmobile 88 with an automatic transmission was converted to run on LPG fuel. The vehicle was equipped with exhuast gas recirculation, two oxidizing catalysts and an air valve to add oxidizing air to the catalysts.

Vehicle #62115

A Buick Gran Sport with 455 CID engine and automatic transmission was equipped with a modified intake manifold to facilitate early fuel evaporation. In addition exhaust gas recirculation, exidizing catalyst and air pump systems were employed. Test fuel was Indolene Clear (lead free).

Test Program

All testing was performed in accordance with the July 2, 1971, Federal Register. This procedure will be used for the certification of 1975 model year light duty vehicles.

Test Results

The full series of tests run by GM and EPA are presented in the Appendix of this report. Vehicle #61421 with the dual bed reactor showed the lowest overall emissions meeting the 1976 emission levels in one test of four.

Vehicle #60418 and #61420 consistentaly achieved the emission levels required for 1975 both having somewhat too high oxides of nitrogen emissions to meet the 1976 requirements.

Conclusions

While three of the vehicles tested demonstrated emission levels approaching those required for 1975 with one of these achieving 1976 levels in one test, these are experimental vehicles with no definitive measure of the durability capabilities of the system. The emission levels measured at the EPA laboratory are generally in good agreement with those measured by General Motors.

4

Vehicle #62115 Early Evaporative Manifold
Oxidizing Catalyst 455 CID
EGR
Buick GS
A.I.R.

	HC		CO				CO_2		NOx	
			Normal		Long Path					
	1972	1975	1972	1975	1972	1975	1972	1975	1972	1975
Testing at GM										
3/15/72	1.09	0.70	---	---	4.05	2.06	---	---	1.23	1.17
3/17/72	1.02	0.72	---	---	4.19	2.30	---	---	1.05	1.02
Testing at EPA										
3/22/72	.91	0.61	4.71	2.46	4.93	2.74	870.1	331.9	1.12	1.07
3/24/72	1.29	0.83	4.16	2.20	4.38	2.42	820.2	781.9	1.18	1.12
Testing at GM										
3/30/72	1.08	0.73	---	---	4.90	2.90	---	---	1.14	1.12
4/4/72	1.04	0.69	---	---	4.90	2.52	---	---	0.91	0.86

Vehicle #61421 Dual Bed Catalyst
EGR 455 CID
Oldsmobile 88
Programmed A.I.R.

	HC		CO				CO_2		NOx	
			Normal		Long Path					
	1972	1975	1972	1975	1972	1975	1972	1975	1972	1975
Testing at GM										
2/8/72	0.49	0.31	---	---	3.41	1.68	---	---	0.46	0.38
2/18/72	0.56	0.36	---	---	5.34	2.72	---	---	0.53	0.43
Testing at EPA										
2/23/72	0.66	0.41	6.19	5.29	6.25	5.35	1025.1	979.7	0.66	0.54
2/24/72	0.73	0.43	8.84	5.33	---	---	1023.1	981.7	0.57	0.48
2/26/72	0.66	0.38	6.26	3.08	6.26	3.10	1008.8	972.7	0.56	0.48
2/29/72	0.63	0.37	4.24	2.16	---	---	942.3	899.3	0.48	0.37
Testing at GM										
3/4/72	0.48	0.34	---	---	4.86	3.70	---	---	0.60	0.48
3/6/72	0.59	0.38	---	---	5.44	2.78	---	---	0.57	0.46

6

Vehicle #61420 Oxidizing Catalyst
EGR 455 CID
Oldsmobile 88
A.I.R.

	HC		CO				CO_2		NOx	
			Normal		Long Path					
	1972	1975	1972	1975	1972	1975	1972	1975	1972	1975
Testing at GM										
2/16/72	0.38	0.27	---	---	7.21	3.87	---	---	1.08	1.10
2/18/72	0.43	0.27	---	---	5.72	3.23	---	---	1.05	1.09
Testing at EPA										
2/23/72	0.29	0.20	6.16	3.62	6.20	3.70	952.0	904.3	1.14	1.16
2/24/72	0.26	0.17	5.52	2.83	5.57	3.04	937.0	889.1	1.07	1.09
2/26/72	0.31	0.18	5.32	3.08	5.28	3.12	938.0	892.2	1.11	1.11
2/28/72	0.40	0.26	5.70	4.03	5.80	4.13	918.9	876.3	1.06	1.08
2/29/72	0.27	0.17	8.14	4.54	8.18	4.67	956.0	911.0	1.16	1.18
Testing at GM										
3/6/72	0.36	0.25	---	---	6.17	2.94	---	---	1.00	1.01
3/10/72	0.35	0.26	---	---	4.48	2.17	---	---	1.18	1.18

Vehicle #60418 LPG
Oxidizing Catalyst 455 CID
EGR - 2 Stage
Oldsmobile 88

	HC		CO				CO_2		NOx	
			Normal		Long Path					
	1972	1975	1972	1975	1972	1975	1972	1975	1972	1975
Testing at GM										
2/29/72	0.32	0.23	---	---	1.99	1.34	---	---	0.80	0.78
3/2/72	0.34	0.23	---	---	3.10	2.28	---	---	0.69	0.70
Testing at EPA										
3/21/72	0.20	---	2.42	---	2.86	---	902.0	---	0.79	---
3/22/72	0.27	0.19	0.96	1.01	1.34	1.28	870.9	866.9	0.72	0.75
3/23/72	0.21	0.15	0.70	0.37	1.20	0.82	889.7	744.4	1.02	0.90
Testing at GM										
4/3/72	0.24	0.19	---	---	1.61	0.97	---	---	0.78	0.82
4/9/72	0.17	0.14	---	---	1.81	1.04	---	---	0.73	0.73